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(54) Title: PEROXYGEN BLEACH-CONTAINING COMPOSITIONS COMPRISING A PARTICULAR CHELATING AGENT SYSTEM

(57) Abstract

The present invention relates to compositions comprising a peroxygen bleach, a chelating agent having a mobility factor greater or equal to 0.7 and a chelating agent having a mobility lower than 0.6, characterised in that the weight ratio of the chelating agent having a mobility factor greater or equal to 0.7 to the chelating agent having a mobility factor lower than 0.6 is of more than 1:1. These compositions are particularly suitable for the cleansing of carpets, resulting in effective overall stains removal performance for example on particulate stains and/or greasy/oil and/or bleachable stains and/or enzymatic stains while proving improved colour fidelity.

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PEROXYGEN BLEACH-CONTAINING COMPOSITIONS COMPRISING A PARTICULAR CHELATING AGENT SYSTEM

Technical Field

The present invention relates to peroxygen bleach-containing compositions particularly suitable for the cleaning of carpets whereby colour safety is improved. Moreover, the compositions of the present invention provide excellent colour safety on the surface treated therewith when used in other applications apart from carpet cleaning applications, such as in laundry applications for example as a laundry detergent, a laundry additive or even a laundry pretreater.

Background of the Invention

Carpets produced from synthetic or natural fibres and mixtures thereof are commonly used in residential and commercial applications as a floor covering. Various types of fibres can be used in making carpets such as polyamide fibres, polyester fibres as well as wool, cotton or even silk in the case of rugs.
However, carpets irrespective of whether they are made from natural or synthetic fibres are all prone to soiling and staining, when contacted with many household items. Foods, grease, oils, beverages in particular such as coffee, tea and soft drinks especially those containing acidic dyes can cause unsightly, often dark stains on carpets. Also fibres may become soiled as a result of dirt particles, clay, dust, i.e., particulate soils in general, coming into contact with and adhering to the fibres of the carpet. These latter soils often appear in the form of a diffuse layer of soils, rather than in the form of spots and tend to accumulate particularly in the so called "high traffic areas" such as near doors as a result of intensive use of the carpets in such areas.

There are a number of carpet cleaning compositions described in the art for removing stains and soils. Some of them are based on peroxygen bleaches. Such peroxygen bleaches are suitable in carpet applications to boost the

removal of encrusted stains/soils, especially in the so called "high traffic areas". However, a drawback associated with such bleach-containing compositions is that said compositions may damage carpet when applied thereto, resulting in colour damage. Without being limited by theory, it is believed that the radical decomposition of peroxygen bleach like hydrogen peroxide is responsible of colour damage. Indeed, the radical decomposition of peroxygen bleach which is catalysed by metal ions like copper or nickel ions present in small quantities as impurities of the raw materials used, provides OH radicals which are very reactive species responsible of colour damage. Also the metal ions themselves can undesirably interact with carpet dyes and change their perceived hue. This also often translates into a darkening of the dye material, which tends to cause the coloured carpet piles to appear drab. Interactions of metal ions with residuals soils may also tend to clear a drab appearance.

Thus, the object of the present invention is to provide compositions particularly suitable for cleaning carpets that deliver overall effective stains removal performance on various types of stains including particulate stains, greasy stains, bleachable stains and/or enzymatic stains while providing improved colour safety.

It has now been found that the above object can be met by formulating compositions which comprise a peroxygen bleach, a chelating agent having a mobility factor greater or equal to 0.7, and a chelating agent having a mobility factor lower than 0.6, at a weight ratio of the chelating agent having a mobility factor greater or equal to 0.7 to the chelating agent having a mobility factor lower than 0.6 of more than 1:1. More particularly, it has been found that the combination of said chelating agents with different mobility factors as defined herein, in a peroxygen bleach-containing composition results in a synergistic effect on colour safety on the treated carpets.

Advantageously, the compositions of the present may be applied directly on the surface to be cleaned like a carpet with reduced colour damage.

A further advantage of the present invention is that beside the improved colour safety delivered to the carpets cleaned with the compositions of the present invention, reduced carpet damage is also observed. Indeed, the compositions

of the present invention are safe to all carpet types, especially delicate natural fibres.

The compositions of the present invention are also suitable to clean upholstery and/or car seats covering. Furthermore, the compositions herein may also be used in laundry applications as a laundry detergent or additive or even in a laundry pretreatment application.

Another advantage of the compositions according to the present invention is that effective overall stain removal performance on various stains is provided including greasy stains, (e.g., make-up, lipstick, dirty motor oil and mineral oil, greasy food like mayonnaise and spaghetti sauce), bleachable stains (e.g., coffee, beverage, food), enzymatic stains (e.g. blood, grass) and/or particulate stains (e.g. clay, dirt, dust, mud, concrete and the like), especially on diffuse layers of stains/soils which occur in the so called "high traffic areas", i.e., on stains/soils which have become otherwise extremely difficult to remove. In addition, the cleaning action of the invention starts as soon as the composition herein has been applied to the surface for example carpet. Indeed, the use of a composition of the present invention on a carpet does not necessarily require rubbing and/or brushing of the carpet.

A further advantage of the present invention is that it is applicable to a variety of compositions, i.e., compositions being either in a liquid form or in a powder form or in a granular form.

Background art

WO 96/15308 discloses a method for cleaning carpets wherein a composition comprising a chelating agent in combination with a soil suspending polycarboxylate or polyamine polymer is applied to said carpet. Suitable

chelants include phosphonate chelating agents, polyfunctionally-substituted aromatic chelating agents, amino carboxylate chelating agents, polyfunctionally-substituted aromatic chelating agents and mixtures thereof. Compositions 3 and 4 exemplified therein comprise hydrogen peroxide (7%), citric acid (0.3%) and diethylene triamine penta methylene phosphonic acid (0.2%).

EP-A-0 751 213 discloses a carpet cleaning composition comprising salicylic acid (0.01%-10%), and a compound selected from the group consisting of amine oxides, soil suspending polycarboxylate or polyamine polymers, hydroxy-pyridine N-oxides, chelating agents and mixtures thereof (0.01%-20%). None of the compositions exemplified comprises a peroxygen bleach, a chelating agent having a mobility factor greater or equal to 0.7, and a chelating agent having a mobility factor lower than 0.6, at a weight ratio of the chelating agent having a mobility factor greater or equal to 0.7 to the chelating agent having a mobility factor lower than 0.6 of more than 1:1.

WO 96/26999 discloses the use of a liquid composition comprising a peroxygen bleach and a compound chelating copper/iron and/or manganese for pretreating a soiled fabric before said fabric is washed, whereby the loss of tensile strength in said fabric is reduced and/or colour damage is reduced. Suitable chelating agents include aminocarboxylates, phosphonates/aminophosphonates, polyfunctionally-substituted aromatic chelating agents, and mixtures thereof. None of the compositions exemplified comprises a mixture of chelating agents according to the present invention.

WO 97/01624 discloses aqueous bleaching compositions comprising a peroxygen bleach and a fabric protection agent having a mobility factor greater than 0.7. None of the compositions exemplified comprises a mixture of chelating agents according to the present invention.

None of these prior art documents discloses nor suggests the synergistic effect on carpet colour safety associated to the compositions of the present invention comprising a peroxygen bleach, a chelating agent having a mobility factor greater or equal to 0.7 and a chelating agent having a mobility of lower than 0.6, at a weight ratio of the chelating agent having a mobility factor greater or equal

to 0.7 to the chelating agent having a mobility factor lower than 0.6 of more than 1:1.

Summary of the Invention

The present invention encompasses a composition particularly suitable for the cleaning of a carpet comprising a peroxygen bleach, a chelating agent having a mobility factor greater or equal to 0.7 and a chelating agent having a mobility factor lower than 0.6, characterised in that the weight ratio of the chelating agent having a mobility factor greater or equal to 0.7 to the chelating agent having a mobility factor lower than 0.6 is of more than 1:1, with the exception of a liquid aqueous composition comprising hydrogen peroxide as the peroxygen bleach at a level of 7% by weight of the total composition, citric acid as the chelating agent having a mobility factor greater or equal to 0.7 at a level of 0.3% by weight and diethylene triamine penta methylene phosphonic acid as the chelating agent having a mobility factor lower than 0.6 at a level of 0.2%.

The present invention further encompasses a method of cleaning a carpet wherein a composition as described herein before, is applied to said carpet, wherein said carpet is then optionally rubbed and/or brushed, and wherein said composition is then removed from said carpet.

The present invention also encompasses a method of pretreating a fabric with a composition as described herein before, said method comprising the steps of applying said composition in its neat form onto the fabric, and allowing said composition to remain in contact with said fabric before said fabric is rinsed, or washed and then rinsed.

All amounts, percentages and ratios are given by weight of the total composition in its neat form unless otherwise stated.

Detailed Description of the Invention

The compositions of the present invention:

The compositions according to the present invention may be formulated either as solids or liquids. In the case where the compositions are formulated as solids for example as granular compositions or powder compositions, they may be applied directly on the carpet to be treated or they may be diluted with an appropriate solvent, typically water, before use. In liquid form, the compositions are preferably, but not necessarily formulated as aqueous compositions. Liquid compositions are preferred herein for convenience of use.

Peroxygen bleach:

As a first essential ingredient, the compositions of the present invention comprise a peroxygen bleach or mixtures thereof.

A preferred peroxygen bleach according to the present invention is hydrogen peroxide or sources thereof. As used herein a hydrogen peroxide source refers to any compound which produces perhydroxyl ions when said compound is in contact with water. Indeed, the presence of a peroxygen bleach, preferably hydrogen peroxide, contributes to the excellent cleaning and bleaching benefits of the compositions of the present invention.

Suitable water-soluble sources of hydrogen peroxide for use herein include percarbonates, persilicates, persulphates such as monopersulfate, perborates, preformed peroxyacids, alkyl hydroperoxides, organic or inorganic peroxides or mixtures thereof. Hydrogen peroxide is preferred to be used in the compositions according to the present invention.

Suitable preformed peroxyacids for use in the compositions according to the present invention include diperoxydodecandioic acid DPDA, magnesium perphthalatic acid, perlauric acid, perbenzoic acid, diperoxyazelaic acid and mixtures thereof.

Suitable organic or inorganic peroxides for use in the compositions of the present invention include diacyl and dialkyl peroxides like dilauroyl peroxide, didecanoyl peroxide, dimyristoyl peroxide or mixtures thereof.

Suitable hydroperoxides for use herein are tert-butyl hydroperoxide, cumyl hydroperoxide, 2,4,4-trimethylpentyl-2-hydroperoxide, di-isopropylbenzene-monohydroperoxide, tert-amyl hydroperoxide, 2,5-dimethyl-hexane-2,5-dihydroperoxide or mixtures thereof.

Typically, the compositions herein comprise from 0.01% to 20% by weight of the total composition of a peroxygen bleach, or mixtures thereof, preferably from 0.5 % to 10%, and more preferably from 1% to 7%.

Chelating agents

As a second essential ingredient, the compositions of the present invention comprise a chelating agent having a mobility factor (defined hereinafter) greater or equal to 0.7 or a mixture thereof.

Mobility Factor - The mobility factor is a measure of the chelating agent's ability to migrate on a cellulose substrate and is experimentally determined in a thin layer chromatography test. The thin layer chromatography test is conducted as follows. A sample of a chelating agent candidate to be measured is spotted onto a Baker-flex Cellulose F' indicating thin layer chromatography plate using a capillary applicator and subsequently developed in an enclosed chamber using 0.001 N aqueous acetic acid:ethanol (50:50 mixture) as the elutant. After drying, the plates are visualised under UV/vis light or exposure to iodine vapor. The "mobility factor" as used herein is thus defined as the retention factor (R_f), commonly recognised by those skilled in the art as the distance in which the sample moved divided by the distance in which the solvent front moved on the thin layer chromatography plate. Said thin layer chromatography methods are well known in the art and are described for example in Touchstone, J. C. *Practice of Thin Layer Chromatography, 3rd Edition*, John Wiley & Sons: New York, 1992.

Therefore, the mobility factor, equal to the retention factor, ranges from 0 to 1, with 1 being the highest mobility. The chelating agents with a high mobility

factor of this invention posses excellent mobility on cellulose, as measured by this mobility test.

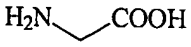
Preferably the chelating agents with a high mobility factor to be used in the compositions of the present invention have a mobility factor of 0.8 or above, more preferably of 0.9 or above.

Additionally, preferred chelating agents with a high mobility factor to be used herein have a stability constant for copper(2+) of at least log K=3 to log K=15, more preferably at least log K=6 to log K=14, still more preferably at least log K=9 to log K=12, at a temperature of 25°C and an ionic strength of 0.1.

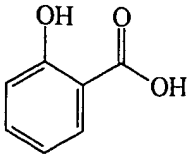
Stability constants are further defined in and procedures for the experimental determination of are included in Martell, A. E.; Smith, R. M. *Critical Stability Constants*, Plenum Press: New York, 1974; Volume 1, and references cited therein. By "stability constant" herein is meant log K values also designated as "log K_1" as defined in Martell, cited above.

The chelating agents with a high mobility factor herein preferably comprise at least two moieties capable of chelating or binding metal ions, such as carboxylic, amino (primary, secondary, or tertiary), amido, hydroxy moieties, and mixtures thereof. Those skilled in the art will recognize that "carboxylic" means either carboxylic acid or the unprotonated carboxylate. Highly preferred chelating agents with a high mobility factor of this invention can be selected from the group consisting of citric acid (Rf=0.9), glycine (Rf=0.9), salicylic acid (Rf=0.9), aspartic acid (Rf=0.7), glutamic acid (Rf=1.0), malonic acid (Rf=0.9), oxalic acid (Rf=1.0), succinic acid (Rf=1.0), picolinic acid (Rf=1.0), phthalic acid (Rf=0.9), dipicolinic acid Rf=0.9), ethydronic acid (EHPG) (Rf=0.7) the corresponding conjugate base salts (i.e., monosodium glutamate), and mixtures thereof.

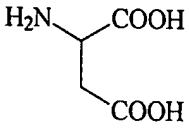
Structures for these compounds are:



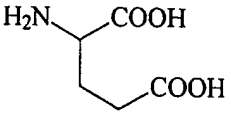
glycine



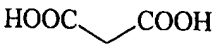
salicylic acid



aspartic acid

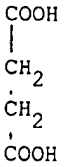


glutamic acid

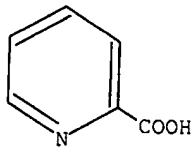


malonic acid

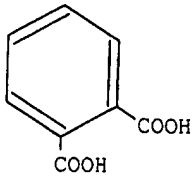
Oxalic acid



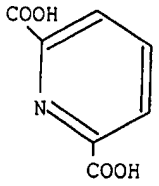
Succinic acid



Picolinic acid



phtalic acid



dipicolinic acid

In highly preferred embodiments of this invention, the chelating agents with a mobility factor greater or equal to 0.7 include those agents selected from the group consisting of citric acid, glycine, salicylic acid, glutamic acid, aspartic acid, the corresponding conjugate base salts (i.e., monosodium glutamate), and mixtures thereof. Salicylic acid is particularly preferred herein and may be commercially available from Rhone Poulenc.

Typically, a preferred concentration range of the chelating agent with a mobility factor greater or equal to 0.7 or a mixture thereof is from 0.01% to 4%, more preferably from 0.1% to 1.5%, and most preferably from 0.1% to 1% by weight of the total bleaching composition.

As a third essential ingredient, the compositions of the present invention comprise a chelating agent having a mobility factor lower than 0.6 or a mixture thereof.

Preferably, the chelating agents with a lower mobility factor for use in the compositions of the present invention have a mobility factor of 0.5 or below, more preferably of 0.3 or below and most preferably of 0.2 or below. Additionally, preferred chelating agents with a low mobility factor to be used herein have a stability constant for copper(2+) of log K=10 to log K=30, more preferably of log K=15 to log K=25, still more preferably of log K=16 to log K=23, at a temperature of 25°C and an ionic strength of 0.1. By "stability constant" herein is meant log K values also designated as "log K_1" as defined in Martell, cited above.

The chelating agents with a low mobility factor herein include phosphonate chelating agents, polyfunctionally-substituted aromatic chelating agents, amino carboxylate chelating agents, other chelating agents like ethylene diamine N,N'-disuccinic acid and mixtures thereof.

Suitable phosphonate chelating agents for use herein may include alkali metal hydroxy ethylidene 1,1 diphosphonates (HEDP), ethane 1-hydroxy diphosphonates as well as amino phosphonate compounds, including aminotri(methylene phosphonate) (ATMP), amino alkylene poly (alkylene phosphonate), alkali metal ethane 1-hydroxy diphosphonates, nitrilo trimethylene phosphonates, ethylene diamine tetra methylene phosphonates, and diethylene triamine penta methylene phosphonates. The phosphonate compounds may be present either in their acid form or as salts of different cations on some or all of their acid functionalities. Such aminophosphonate chelating agents are commercially available from Monsanto under the trade name DEQUEST®.

Preferred phosphonate chelating agents to be used herein are alkali metal hydroxy ethylidene 1,1 diphosphonates (HEDP) (Rf=0.2) and/or diethylene triamine penta methylene phosphonates (DETPMP) (Rf=0.0).

Polyfunctionally-substituted aromatic chelating agents may also be useful in the compositions herein. See U.S. patent 3,812,044, issued May 21, 1974, to Connor et al. Preferred compounds of this type in acid form are dihydroxydisulfobenzenes such as 1,2-dihydroxy -3,5-disulfobenzene.

A preferred biodegradable chelating agent for use herein is ethylene diamine N,N'- disuccinic acid, or alkali metal, or alkaline earth, ammonium or substitutes ammonium salts thereof or mixtures thereof. Ethylenediamine N,N'- disuccinic acids, especially the (S,S) isomer have been extensively described in US patent 4, 704, 233, November 3, 1987. to Hartman and Perkins. Ethylenediamine N,N'- disuccinic acids (Rf=0.5) is, for instance, commercially available under the tradename ssEDDS® from Palmer Research Laboratories.

Suitable amino carboxylate chelating agents for use herein include ethylene diamine tetra acetates, diethylene triamine pentaacetates, diethylene triamine pentaacetate (DTPA), N-hydroxyethylethylenediamine triacetates, nitrilotri-acetates, ethylenediamine tetrapropionates, triethylenetetraaminehexa-acetates, ethanoldiglycines, propylene diamine tetracetic acid (PDTA) and methyl glycine di-acetic acid (MGDA), both in their acid form, or in their alkali metal, ammonium, and substituted ammonium salt forms. Particularly suitable amino carboxylates to be used herein is diethylene triamine penta acetic acid (DTPA) (Rf=0.3).

Typically, the compositions herein comprise from 0.01% to 2% by weight of the total composition of a chelating agent having a mobility factor lower than 0.6 or mixtures thereof, preferably from 0.02% to 1%, and more preferably from 0.02% to 0.6%.

It has now been found that improved colour safety to carpet is obtained with the compositions of the present invention comprising a peroxygen bleach, a chelating agent having a mobility factor greater or equal to 0.7 and a chelating agent having a mobility factor lower than 0.6, at a weight ratio of the chelating

agent having a mobility factor greater or equal to 0.7 to the chelating agent having a mobility factor lower than 0.6 of more than 1:1.

By "improved colour safety", it is meant herein that the colour damage (i.e. colour change and/or decoloration) on the surface treated, e.g. carpet piles, is reduced upon treatment with the compositions of the present invention or even that the true colors and graduations of colors imparted by colored dyes on said surfaces is maintained, as compared to the colour damage observed when using the same compositions, but without the chelating system of the present invention or only one of these chelating agents at the same total level of chelating agents. More particularly, there is a synergistic effect on carpet colour safety associated to the use of the compositions of the present invention to cleaning carpets.

In a preferred embodiment herein the weight ratio of the chelating agent having a mobility factor greater or equal to 0.7 to the chelating agent having a mobility factor lower than 0.6 is from 1.1:1 to 10:1, preferably from 1.2:1 to 6:1, more preferably from 1.5:1 to 4:1 and most preferably from 2:1 to 3.5:1.

The improvement in colour safety afforded by the present invention can be measured in several different ways. For example panels of expert graders can visually compare carpet portions treated with the compositions according to the present invention comprising a peroxygen bleach and chelating agent system with at least a chelating agent having a low mobility factor and a chelating agent having a high mobility factor as described herein, with carpet portions treated with a reference composition, e.g. the same composition, but with only one of these chelating agents at same total level of chelating agents.

Stained portion of carpets (commercially available from ITALPACK) are each individually treated with a liquid composition according to the present invention and a reference composition, i.e. that the compositions are applied neat onto the carpets portions left to act thereon for about 1/2 minute, after which the carpet portions are rubbed with a wetted sponge and vacuum cleaned after 24 hours. The colour safety can be evaluated by comparing side by side the carpet portions treated according to the compositions of the present invention and the reference composition.

Differences and graduations in colour can be visually assessed and ranked according to Panel Score Units (PSU) using any suitable scale. For example, numerical PSU grades can be assigned on the basis of comments such as:
O = no difference
1 = there seems to be a difference
2 = there is a clear difference
3 = there is a big difference
4 = there is a big difference

PSU data can be handled statistically using conventional techniques.

Alternatively, various types of optical apparatus and procedures can be used to assess the improvement in colour safety afforded by the present invention. For example, when evaluating colour safety on fabrics measurements with Hunterlab colour Quest 45/0 apparatus can be used.

An advantage associated to the present invention is that the carpet damage is also reduced.

The pH of the liquid compositions according to the present invention can be from 1 to 14. In a preferred embodiment, the recommended pH range is from 1 to 8, preferably between pH 1 and 7, more preferably between pH 1 and 6 and most preferably between 4 and 6. These preferred pH ranges contribute to the stain removal of the compositions herein. Also these preferred pH ranges contribute to the stability of hydrogen peroxide. Accordingly, the compositions herein may further comprise an acid or base to adjust pH as appropriate. The acids that may be used for these purposes can be organic acids (e.g. citric acid) or inorganic acids such as sulphuric acid. The bases for use herein can be organic or inorganic bases, preferably inorganic bases such as sodium hydroxide.

Optional ingredients:
The compositions herein may further comprise a number of additional compounds such as surfactants, soil suspending polyamine polymers, soil suspending polycarboxylate polymers, builder system, radical scavengers,

solvents, perfumes, dyes, suds suppressing agents, enzymes, photobleaching agents, and other minors.

Surfactants:

Surfactants may be used in the compositions of the present invention. Surfactants for use herein are those well known in the art and include anionic, nonionic, zwitterionic, amphoteric and cationic surfactants and mixtures thereof. The surfactants suitable for use herein are compatible with peroxygen bleaches like hydrogen peroxide and sources thereof.

Typically, the compositions herein comprise up to 50% by weight of the total composition of a surfactant or mixtures thereof, preferably from 0.1% to 30% and more preferably from 0.5% to 10%.

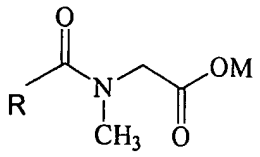
Particularly suitable surfactants for use herein are anionic surfactants. Said anionic surfactants are preferred herein as they contribute to the stain removal performance of the compositions of the present invention on various types of stains. Moreover they do not stick on carpet, thereby reducing resoiling.

Suitable anionic surfactants for use herein include sulfonate and sulfate surfactants. The like anionic surfactants are well-known in the art and have found wide application in commercial detergents. These anionic surfactants include the C6-C22 alkyl benzene sulfonates (LAS), the C6-C22 alkyl sulfates (AS), unsaturated sulfates such as oleyl sulfate, the C8-C18 alkyl alkoxy sulfates (AES) and the C8-C18 alkyl alkoxy carboxylates. The neutralising cation for the anionic synthetic sulfonates and/or sulfates is represented by conventional cations which are widely used in detergent technology such as sodium, potassium or alkanolammonium. Preferred herein are the alkyl sulphate, especially coconut alkyl sulphate having from 6 to 18 carbon atoms in the alkyl chain, preferably from 8 to 15, or mixtures thereof.

Other anionic surfactants useful for detersive purposes can also be used herein. These can include salts (including, for example, sodium, potassium, ammonium, and substituted ammonium salts such as mono-, di- and triethanolamine salts) of soap, C_8-C_{22} primary or secondary alkanesulfonates, C_8-C_{24} olefinsulfonates, sulfonated polycarboxylic acids prepared by sulfonation of the pyrolyzed product

of alkaline earth metal citrates, e.g., as described in British patent specification No. 1,082,179, C_8-C_{24} alkylpolyglycolethersulfates (containing up to 10 moles of ethylene oxide); alkyl ester sulfonates such as C_{14-16} methyl ester sulfonates; acyl glycerol sulfonates, fatty oleyl glycerol sulfates, alkyl phenol ethylene oxide ether sulfates, paraffin sulfonates, alkyl phosphates, isethionates such as the acyl isethionates, N-acyl taurates, alkyl succinamates and sulfosuccinates, monoesters of sulfosuccinate (especially saturated and unsaturated C_{12}-C_{18} monoesters) diesters of sulfosuccinate (especially saturated and unsaturated C_6-C_{14} diesters), sulfates of alkylpolysaccharides such as the sulfates of alkylpolyglucoside (the nonionic nonsulfated compounds being described below). Resin acids and hydrogenated resin acids are also suitable, such as rosin, hydrogenated rosin, and resin acids and hydrogenated resin acids present in or derived from tall oil. Further examples are given in "Surface Active Agents and Detergents" (Vol. I and II by Schwartz, Perry and Berch). A variety of such surfactants are also generally disclosed in U.S. Patent 3,929,678, issued December 30, 1975 to Laughlin, et al. at Column 23, line 58 through Column 29, line 23 (herein incorporated by reference).

Other suitable anionic surfactants for use herein also include acyl sarcosinate or mixtures thereof, in its acid and/or salt form, preferably long chain acyl sarcosinates having the following formula:



wherein M is hydrogen or a cationic moiety and wherein R is an alkyl group of from 11 to 15 carbon atoms, preferably of from 11 to 13 carbon atoms. Preferred M are hydrogen and alkali metal salts, especially sodium and potassium. Said acyl sarcosinate surfactants are derived from natural fatty acids and the amino-acid sarcosine (N-methyl glycine). They are suitable to be used as aqueous solution of their salt or in their acidic form as powder. Being derivatives of natural fatty acids, said acyl sarcosinates are rapidly and completely biodegradable and have good skin compatibility.

Accordingly, particularly preferred long chain acyl sarcosinates for use herein include C_{12} acyl sarcosinate (i.e. an acyl sarcosinate according to the above formula wherein M is hydrogen and R is an alkyl group of 11 carbon atoms) and C_{14} acyl sarcosinate (i.e. an acyl sarcosinate according to the above formula wherein M is hydrogen and R is an alkyl group of 13 carbon atoms). C_{12} acyl sarcosinate is commercially available, for example, as Hamposyl L-30® supplied by Hampshire. C_{14} acyl sarcosinate is commercially available, for example, as Hamposyl M-30® supplied by Hampshire.

Other particularly suitable surfactants for use herein include amine oxide surfactants according to the formula R1R2R3NO, wherein each of R1, R2 and R3 is independently a saturated substituted or unsubstituted, linear or branched alkyl groups of from 1 to 30 carbon atoms, preferably of from 1 to 20 carbon atoms, and mixtures thereof.

Particularly preferred amine oxide surfactants for use according to the present invention are amine oxide surfactants having the following formula $R_1R_2R_3NO$ wherein R1 is a saturated linear or branched alkyl group of from 1 to 30 carbon atoms, preferably of from 6 to 20 carbon atoms, more preferably of from 6 to 16 carbon atoms, and wherein R2 and R3 are independently substituted or unsubstituted, linear or branched alkyl groups of from 1 to 4 carbon atoms, preferably of from 1 to 3 carbon atoms, and more preferably are methyl groups. In a preferred embodiment of the present invention said amine oxide surfactants used are pure-cut amine oxide surfactants, i.e., a pure single amine oxide surfactant, e.g. C_8 N,N-dimethyl amine oxide, as opposed to mixtures of amine oxide surfactants of different chain lengths

Suitable amine oxide surfactants for use herein are for instance pure cut C8 amine oxide, pure cut C10 amine oxide, pure cut C14 amine oxide, natural blend C8-C10 amine oxides as well as natural blend C12-C16 amine oxides. Such amine oxide surfactants may be commercially available from Hoechst or Stephan.

Such amine oxide surfactants are preferred herein as they contribute to the stain removal performance of the compositions herein on various types of stains. Also such amine oxide surfactants contribute to improve the chemical stability of said compositions. It is believed that improved chemical stability associated to the

use of said amine oxide surfactants in bleaching compositions is due to the capacity of said amine oxide surfactants to lower the decomposition of said source of active oxygen and/or to limit interactions between said source of active oxygen and a bleach activator, if present, possibly through emulsification. It is believed that this stabilising effect is matrix independent.

Furthermore, amine oxide surfactants, especially pure-cut amine oxide surfactants, have the advantage to reduce the amount of residues left onto carpet fibres being treated with a composition comprising them. Also, the residues left after said composition comprising them has performed its cleaning action onto said carpet fibres are partially in a crystalline form. Indeed, it has been observed that with the compositions of the present invention which comprise said amine oxide surfactants, and especially a pure-cut amine oxide surfactant, more than 90%, preferably more than 95% of the residues left onto the carpet fibres are crystals (generally lamellar and/or needle-shaped) with an average particle surface bigger than $300\mu^2$. This results in a process of cleaning carpets whereby the residues left onto the carpets are removed more easily as opposed to residues being sticky and thus difficult to remove by for example vacuum cleaning said carpets.

Other nonionic surfactants which may be used herein include any liquid or solid ethoxylated C_6-C_{24} fatty alcohol nonionic surfactant, alkyl ethoxylated/propoxylated nonionic surfactants (of the Lutensol®, Neodol® and/or Dobanol® series available from Shell), fatty acid C_6-C_{24} alkanolamides, C_6-C_{20} polyethylglycol ethers, polyethylene glycol with molecular weight 1000 to 80000 and alkyl pyrrolidones.

Other suitable nonionic surfactants for use herein include polyhydroxy fatty acid amide surfactants, or mixtures thereof, according to the formula:

$$R^2 - C(O) - N(R^1) - Z,$$

wherein R^1 is H, or C_1-C_4 alkyl, C_1-C_4 hydrocarbyl, 2-hydroxy ethyl, 2-hydroxy propyl or a mixture thereof, R^2 is C_5-C_{31} hydrocarbyl, and Z is a polyhydroxyhydrocarbyl having a linear hydrocarbyl chain with at least 3 hydroxyls directly connected to the chain, or an alkoxylated derivative thereof.

Preferably, R^1 is C_1-C_4 alkyl, more preferably C_1 or C_2 alkyl and most preferably methyl, R^2 is a straight chain C_7-C_{19} alkyl or alkenyl, preferably a straight chain C_9-C_{18} alkyl or alkenyl, more preferably a straight chain C_{11}-C_{18} alkyl or alkenyl, and most preferably a straight chain C_{11}-C_{14} alkyl or alkenyl, or mixtures thereof. Z preferably will be derived from a reducing sugar in a reductive amination reaction; more preferably Z is a glycityl. Suitable reducing sugars include glucose, fructose, maltose, lactose, galactose, mannose and xylose. As raw materials, high dextrose corn syrup, high fructose corn syrup, and high maltose corn syrup can be utilised as well as the individual sugars listed above. These corn syrups may yield a mix of sugar components for Z. It should be understood that it is by no means intended to exclude other suitable raw materials. Z preferably will be selected from the group consisting of $-CH_2-(CHOH)_n-CH_2OH$, $-CH(CH_2OH)-(CHOH)_{n-1}-CH_2OH$, $-CH_2-(CHOH)_2-(CHOR')(CHOH)-CH_2OH$, where n is an integer from 3 to 5, inclusive, and R' is H or a cyclic or aliphatic monosaccharide, and alkoxylated derivatives thereof. Most preferred are glycityls wherein n is 4, particularly $CH_2-(CHOH)_4-CH_2OH$.

In formula $R^2 - C(O) - N(R^1) - Z$, R^1 can be, for example, N-methyl, N-ethyl, N-propyl, N-isopropyl, N-butyl, N-2-hydroxy ethyl, or N-2-hydroxy propyl. $R^2 - C(O) - N<$ can be, for example, cocamide, stearamide, oleamide, lauramide, myristamide, capricamide, palmitamide, tallowamide and the like. Z can be 1-deoxyglucityl, 2-deoxyfructityl, 1-deoxymaltityl, 1-deoxylactityl, 1-deoxygalactityl, 1-deoxymannityl, 1-deoxymaltotriotityl and the like.

Suitable polyhydroxy fatty acid amide surfactants for use herein may be commercially available under the trade name HOE® from Hoechst.

Methods for making polyhydroxy fatty acid amide surfactants are known in the art. In general, they can be made by reacting an alkyl amine with a reducing sugar in a reductive amination reaction to form a corresponding N-alkyl polyhydroxyamine, and then reacting the N-alkyl polyhydroxyamine with a fatty aliphatic ester or triglyceride in a condensation/amidation step to form the N-alkyl, N-polyhydroxy fatty acid amide product. Processes for making compositions containing polyhydroxy fatty acid amides are disclosed for example in GB patent specification 809,060, published February 18, 1959, by Thomas

Hedley & Co., Ltd., US patent 2,965,576, issued December 20, 1960 to E.R. Wilson, US patent 2,703,798, Anthony M. Schwartz, issued March 8, 1955, US patent 1,985,424, issued December 25, 1934 to Piggott and WO92/06070, each of which is incorporated herein by reference.

Suitable cationic surfactants for use herein include quaternary ammonium compounds of the formula $R_1R_2R_3R_4N^+$ where R_1,R_2 and R_3 are methyl groups, and R_4 is a C_{12-15} alkyl group, or where R_1 is an ethyl or hydroxy ethyl group, R_2 and R_3 are methyl groups and R_4 is a C_{12-15} alkyl group.

Zwitterionic surfactants are also suitable optional ingredients for use herein. Suitable zwitterionic surfactants include derivatives of aliphatic quaternary ammonium, phosphonium, and sulphonium compounds in which the aliphatic moiety can be straight or branched chain and wherein one of the aliphatic substituents contains from about 8 to about 24 carbon atoms and another substituent contains, at least, an anionic water-solubilizing group. Particularly preferred zwitterionic materials are the ethoxylated ammonium sulphonates and sulfates disclosed in U.S. Patents 3,925,262, Laughlin et al., issued December 9, 1975 and 3,929,678, Laughlin et al., issued December 30, 1975.

Suitable zwitterionic betaine surfactants for use herein contain both a cationic hydrophilic group, i.e., a quaternary ammonium group, and anionic hydrophilic group on the same molecule at a relatively wide range of pH's. The typical anionic hydrophilic groups are carboxylates and sulfonates, although other groups like sulfates, phosphonates, and the like can be used. A generic formula for the zwitterionic betaine surfactants to be used herein is :

$$R_1\text{-}N^+(R_2)(R_3)R_4X^-$$

wherein R_1 is a hydrophobic group; R_2 is hydrogen, C_1-C_6 alkyl, hydroxy alkyl or other substituted C_1-C_6 alkyl group; R_3 is C_1-C_6 alkyl, hydroxy alkyl or other substituted C_1-C_6 alkyl group which can also be joined to R_2 to form ring structures with the N, or a C_1-C_6 carboxylic acid group or a C_1-C_6 sulfonate group; R_4 is a moiety joining the cationic nitrogen atom to the hydrophilic group and is typically an alkylene, hydroxy alkylene, or polyalkoxy group containing

from 1 to 10 carbon atoms; and X is the hydrophilic group which is a carboxylate or sulfonate group.

Preferred hydrophobic groups R_1 are aliphatic or aromatic, saturated or unsaturated, substituted or unsubstituted hydrocarbon chains that can contain linking groups such as amido groups, ester groups. More preferred R_1 is an alkyl group containing from 1 to 24 carbon atoms, preferably from 8 to 18, and more preferably from 10 to 16. These simple alkyl groups are preferred for cost and stability reasons. However, the hydrophobic group R_1 can also be an amido radical of the formula R_a-C(O)-NH-$(C(R_b)_2)_m$, wherein R_a is an aliphatic or aromatic, saturated or unsaturated, substituted or unsubstituted hydrocarbon chain, preferably an alkyl group containing from 8 up to 20 carbon atoms, preferably up to 18, more preferably up to 16, R_b is selected from the group consisting of hydrogen and hydroxy groups, and m is from 1 to 4, preferably from 2 to 3, more preferably 3, with no more than one hydroxy group in any $(C(R_b)_2)$ moiety.

Preferred R_2 is hydrogen, or a C_1-C_3 alkyl and more preferably methyl. Preferred R_3 is a C_1-C_4 carboxylic acid group or C1-C4 sulfonate group, or a C_1-C_3 alkyl and more preferably methyl. Preferred R_4 is $(CH2)_n$ wherein n is an integer from 1 to 10, preferably from 1 to 6, more preferably is from 1 to 3.

Some common examples of betaine/sulphobetaine are described in U.S. Pat. Nos. 2,082,275, 2,702,279 and 2,255,082, incorporated herein by reference.

Examples of particularly suitable alkyldimethyl betaines include coconut-dimethyl betaine, lauryl dimethyl betaine, decyl dimethyl betaine, 2-(N-decyl-N, N-dimethyl-ammonia)acetate, 2-(N-coco N, N-dimethylammonio) acetate, myristyl dimethyl betaine, palmityl dimethyl betaine, cetyl dimethyl betaine, stearyl dimethyl betaine. For example Coconut dimethyl betaine is commercially available from Seppic under the trade name of Amonyl 265®. Lauryl betaine is commercially available from Albright & Wilson under the trade name Empigen BB/L®.

Examples of amidobetaines include cocoamidoethylbetaine, cocoamidopropyl betaine or C10-C14 fatty acylamidopropylene(hydropropylene)sulfobetaine. For

example C10-C14 fatty acylamidopropylene(hydropropylene)sulfobetaine is commercially available from Sherex Company under the trade name "Varion CAS® sulfobetaine".

A further example of betaine is Lauryl-immino-dipropionate commercially available from Rhone-Poulenc under the trade name Mirataine H2C-HA ®.

Soil suspending polymers:

Any soil suspending polycarboxylate polymer known to those skilled in the art can be used according to the present invention such as homo- or co-polymeric polycarboxylic acids or their salts including polyacrylates and copolymers of maleic anhydride or/and acrylic acid and the like. Indeed, such soil suspending polycarboxylate polymers can be prepared by polymerizing or copolymerizing suitable unsaturated monomers, preferably in their acid form. Unsaturated monomeric acids that can be polymerized to form suitable polymeric polycarboxylates include acrylic acid, maleic acid (or maleic anhydride), fumaric acid, itaconic acid, aconitic acid, mesaconic acid, citraconic acid and methylenemalonic acid. The presence in the polymeric polycarboxylates herein of monomeric segments, containing no carboxylate radicals such as vinylmethyl ether, styrene, ethylene, etc. is suitable provided that such segments do not constitute more than about 40% by weight.

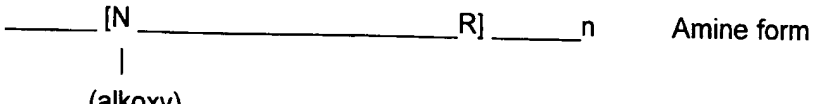
Particularly suitable polymeric polycarboxylates to be used herein can be derived from acrylic acid. Such acrylic acid-based polymers which are useful herein are the water-soluble salts of polymerized acrylic acid. The average molecular weight of such polymers in the acid form preferably ranges from about 2,000 to 10,000, more preferably from about 4,000 to 7,000 and most preferably from about 4,000 to 5,000. Water-soluble salts of such acrylic acid polymers can include, for example, the alkali metal, ammonium and substituted ammonium salts. Soluble polymers of this type are known materials. Use of polyacrylates of this type in detergent compositions has been disclosed, for example, in Diehl, U.S. Patent 3,308,067, issued March 7, 1967.

Acrylic/maleic-based copolymers may also be used as a preferred soil suspending polycarboxylic polymer. Such materials include the water-soluble salts of copolymers of acrylic acid and maleic acid. The average molecular

weight of such copolymers in the acid form preferably ranges from about 2,000 to 100,000, more preferably from about 5,000 to 75,000, most preferably from about 7,000 to 65,000. The ratio of acrylate to maleate segments in such copolymers will generally range from about 30:1 to about 1:1, more preferably from about 10:1 to 2:1. Water-soluble salts of such acrylic acid/maleic acid copolymers can include, for example, the alkali metal, ammonium and substituted ammonium salts. Soluble acrylate/maleate copolymers of this type are known materials which are described in European Patent Application No. 66915, published December 15, 1982. Particularly preferred is a copolymer of maleic / acrylic acid with an average molecular weight of about 70,000. Such copolymers are commercially available from BASF under the trade name SOKALAN CP5.

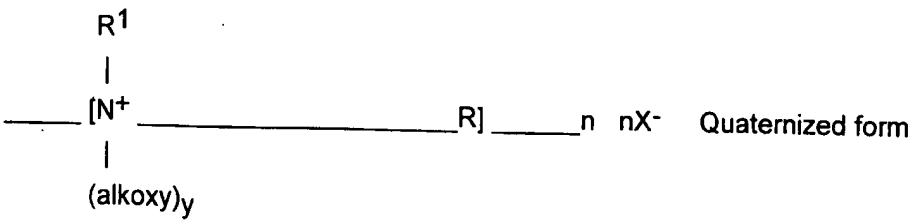
Typically, the compositions herein comprise up to 10% by weight of the total composition of a soil suspending polycarboxylate polymer or mixtures thereof, preferably from 0.1% to 8% and more preferably from 0.5% to 4%.

Any soil suspending polyamine polymer known to those skilled in the art may also be used herein. Particularly suitable polyamine polymers for use herein are polymers having polyalkoxymoiety are alkoxylated polyamines. Such materials can conveniently be represented as molecules of the empirical structures with repeating units :



Amine form

and

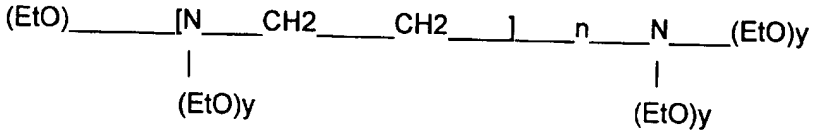


Quaternized form

wherein R is a hydrocarbyl group, usually of 2-6 carbon atoms; R^1 may be a C_1-C_{20} hydrocarbon; the alkoxy groups are ethoxy, propoxy, and the like, and y is

2-30, most preferably from 10-20; n is an integer of at least 2, preferably from 2-20, most preferably 3-5; and X^- is an anion such as halide or methylsulfate, resulting from the quaternization reaction.

The most highly preferred polyamines for use herein are the so-called ethoxylated polyethylene amines, i.e., the polymerized reaction product of ethylene oxide with ethyleneimine, having the general formula :

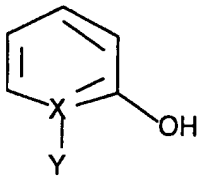


when y = 2-30. Particularly preferred for use herein is an ethoxylated polyethylene amine, in particular ethoxylated tetraethylenepentamine, and quaternized ethoxylated hexamethylene diamine.

Typically, the compositions herein comprise up to 10% by weight of the total composition of a soil suspending polyamine polymer or mixtures thereof, preferably from 0.1% to 8% and more preferably from 0.5% to 4%.

Hydroxy pyridine N-oxides:

The compositions herein may also comprise a hydroxy pyridine N-oxides or derivatives thereof according to the following formula:



wherein X is nitrogen, Y is one of the following groups oxygen, -CHO, -OH, -(CH2)n-COOH, wherein n is an integer of from 0 to 20, preferably of from 0 to 10 and more preferably is 0, and wherein Y is preferably oxygen. Accordingly, particularly preferred hydroxy pyridine N-oxides or derivatives thereof to be used herein is 2-hydroxy pyridine N-oxide.

Hydroxy pyridine N-oxides or derivatives thereof may be commercially available from Sigma.

Typically, the compositions herein comprise up to 2% by weight of the total composition of a hydroxy pyridine N-oxide or derivatives thereof or mixtures thereof, preferably from 0.001% to 1% and more preferably from 0.001% to 0.5%.

Solvents:

The compositions according to the present invention may further comprise a solvent or a mixture thereof. Typical solvents for use herein include both hydrophobic and hydrophilic ones.

Suitable alcohols for use herein are according to the formula R-OH wherein R is a linear or branched, saturated or unsaturated hydrocarbon chain of 1 to 4 carbon atoms, preferably of 2 to 4 carbon atoms and most preferably of 4 carbon atoms, or mixtures thereof.

Suitable C1-C4 alcohols for use herein include isopropyl alcohol, propyl alcohol, ethanol and/or methanol. Highly preferred herein is isopropyl alcohol. Isopropanol may be commercially available from Merck/BDH Italia under its chemical name.

Other suitable solvents for use herein are hydrophilic solvents comprising one or more ether groups and having a solubility in water higher than 10 ml per 100ml at 25°C, polyol hydrophilic solvents having a solubility in water higher than 10 ml per 100 ml at 25°C, hydrophobic solvents having a solubility in water lower than 10 ml per 100ml at 25°C and mixtures thereof.

Preferably, the hydrophilic solvents to be used herein have a solubility in water higher than 15 ml per 100 ml at 25°C and more preferably higher than 20 ml per 100 ml at 25°C. The hydrophobic solvents to be used herein preferably have a

solubility in water lower than 7ml per 100 ml at 25°C and more preferably lower than 5 ml per 100 ml at 25°C.

By "solubility" of a given compound, it is to be understood herein the amount of said compound solubilized in deionized water at 25°C. Thus, a compound having a solubility being lower than 10 ml per 100ml means that when less than 10 ml of said given compound is incorporated in 100 ml of deionized water at 25°C said compound is entirely dissolved in said water, i.e., a clear and stable solution is obtained. In other words, incorporating 10 ml per 100 ml or more of said given compound in water will result in a precipitation of said compound in said medium.

Suitable hydrophilic solvents comprising one or more ether groups to be used herein include glycol ethers and/or derivatives thereof. Suitable glycol ethers and/or derivatives thereof to be used herein include monoglycol ethers and/or derivatives thereof, polyglycol ethers and/or derivatives thereof and mixtures thereof.

Suitable monoglycol ethers and derivatives thereof to be used herein include n-buthoxypropanol (n-BP), water-soluble CELLOSOLVE® solvents or mixtures thereof. Preferred Cellosolve® solvents include propoxy ethyl acetate salt (i.e., Propyl Cellosolve acetate salt®), ethanol-2-butoxy phosphate salt (i.e., Butyl Cellosolve phosphate salt®), 2-(Hexyloxy)ethanol (i.e., 2-hexyl Cellosolve®), 2-ethoxy ethanol (i.e., 2-ethyl Cellosolve®), 2-butoxyethanol (i.e., 2-buthyl Cellosolve®) or mixtures thereof.

Suitable polyglycol ethers and derivatives thereof to be used herein include n-butoxypropoxypropanol (n-BPP), butyl triglycol ether (BTGE), butyl diglycol ether (BDGE), water-soluble CARBITOL® solvents or mixtures thereof.

Preferred water-soluble CARBITOL® solvents are compounds of the 2-(2-alkoxyethoxy)ethanol class, 2-(2-alkoxyethoxy)propanol class and/or 2-(2-alkoxyethoxy)butanol class wherein the alkoxy group is derived from ethyl, propyl or butyl. A preferred water-soluble carbitol is 2-(2-butoxyethoxy)ethanol also known as butyl carbitol®.

Preferred hydrophilic solvents having one or more ether groups for use herein are 2-ethoxyethanol, 2-butoxyethanol, n-butoxypropoxypropanol, butyl carbitol® or mixtures thereof.

Suitable polyol hydrophilic solvents to be used herein are the polyols having at least 2 hydroxyl groups (-OH) like diols. Suitable diols to be used herein include 2-ethyl-1,3-hexanediol, 2,2,4-trimethyl-1,3-pentanediol, methyl-2,4 pentanediol or mixture thereof.

Suitable hydrophobic solvents to be used herein include hydrophobic aliphatic or aromatic alcohols or mixtures thereof.

Suitable hydrophobic aromatic alcohols to be used herein are according to the formula R_1-OH wherein R_1 is an alkyl substituted or non-alkyl substituted aryl group of from 1 to 20 carbon atoms, preferably from 2 to 15 and more preferably from 2 to 10. A suitable aromatic alcohol to be used herein is benzyl alcohol.

Suitable hydrophobic aliphatic alcohols to be used herein are according to the formula R_2-OH wherein R_2 is a linear or branched saturated or unsaturated hydrocarbon chain of from 5 to 20 carbon atoms, preferably from 6 to 15 and more preferably from 8 to 10. Suitable aliphatic alcohols to be used herein include linear alcohols like 2-octanol and/or decanol.

The preferred hydrophobic solvent for use herein is benzyl alcohol.

In a preferred embodiment herein C1-C4 alcohols are used together with another solvent as described herein before, at a weight ratio of said C1-C4 alcohol to said second solvent of 1:10 to 1:1.1, preferably of 1:6 to 1:1.5, more preferably of 1:4 to 1:1.8 and most preferably of 1:3 to 1:2. Typically the total level of solvents in the liquid compositions of the present invention is up to 20%, preferably from 0.5% to 10% and more preferably from 1% to 8% by weight of the total composition.

Such mixtures of solvents are preferably present in the compositions of the present invention as they further contribute to the effective stains removal performance delivered by the compositions of the present invention on various

stains including particulate stains as well as greasy/oily stains, bleachable stains and/or enzymatic stains. This cleaning benefit is particularly noticeable on particulate soils. Indeed, it is speculated that the preferred solvents system herein have a chemical action on particulate stains like dust, clay and the like as well as a mechanical action. Indeed, it is believed that when such a preferred composition according to the present invention, in its liquid form, is applied onto a carpet, the foam produced incorporates the particulate soils present in the carpet fibres and bring them to the surface of the carpet as it dissolves, facilitating thereby the particulate soil removal.

Advantageously the preferred compositions herein comprising such a solvent system as described herein on top of a peroxygen bleach and the chelating system as described herein, and being formulated as liquid aqueous compositions, deliver improved chemical stability. Accordingly, said compositions are convenient for the consumer to use. Indeed, said liquid aqueous compositions for the cleaning of carpets according to the present invention do not require pH adjustment prior to use and can be stored for long periods of time prior to use.

The concentration of available oxygen can be determined by methods known in the art, such as the iodimetric method, the permanganometric method and the cerimetric method. Said methods and the criteria for the choice of the appropriate method are described for example in "Hydrogen Peroxide", W. C. Schumb, C. N. Satterfield and R. L. Wentworth, Reinhold Publishing Corporation, New York, 1955 and "Organic Peroxides", Daniel Swern, Editor Wiley Int. Science, 1970. A preferred method to be used herein is the iodimetric method.

As used herein, available oxygen concentration refers to the percentage concentration of elemental oxygen, with an oxidation number zero, that being reduced to water would be stoichiometrically equivalent to a given percentage concentration of a given peroxide compound, when the peroxide functionality of the peroxide compound is completely reduced to oxides. The peroxygen bleaches according to the present invention increase the ability of the compositions to remove colored stains, to destroy malodorous molecules and to kill germs.

Radical scavengers:

The compositions herein may comprise a radical scavenger as another optional ingredient. Suitable radical scavengers for use herein include the well-known substituted mono and di hydroxy benzenes and derivatives thereof, alkyl- and aryl carboxylates and mixtures thereof. Preferred radical scavengers for use herein include di-tert-butyl hydroxy toluene (BHT), p-hydroxy-toluene, hydroquinone (HQ), di-tert-butyl hydroquinone (DTBHQ), mono-tert-butyl hydroquinone (MTBHQ), tert-butyl-hydroxy anysole (BHA), p-hydroxy-anysol, benzoic acid, 2,5-dihydroxy benzoic acid, 2,5-dihydroxyterephtalic acid, toluic acid, catechol, t-butyl catechol, 4-allyl-catechol, 4-acetyl catechol, 2-methoxy-phenol, 2-ethoxy-phenol, 2-methoxy-4-(2-propenyl)phenol, 3,4-dihydroxy benzaldehyde, 2,3-dihydroxy benzaldehyde, benzylamine, 1,1,3-tris(2-methyl-4-hydroxy-5-t-butylphenyl) butane, tert-butyl-hydroxy-anyline, p-hydroxy anyline as well as n-propyl-gallate. Highly preferred for use herein are di-tert-butyl hydroxy toluene, which is for example commercially available from SHELL under the trade name IONOL CP® and/or tert-butyl-hydroxy anysole and/or propyl gallate. These radical scavengers further contribute to the stability of the peroxygen bleach-containing compositions herein.

Typically, the compositions according to the present invention comprise up to 5% by weight of the total composition of a radical scavenger, or mixtures thereof, preferably from 0.002% to 1.5% by weight and more preferably from 0.002% to 0.5%.

Bleach activators:

The compositions according to the present invention may further comprise a bleach activator or mixtures thereof, as another optional ingredient. By "bleach activator", it is meant herein a compound which reacts with hydrogen peroxide to form a peracid. The peracid thus formed constitutes the activated bleach. Suitable bleach activators to be used herein include those belonging to the class of esters, amides, imides, or anhydrides. Examples of suitable compounds of this type are disclosed in British Patent GB 1 586 769 and GB 2 143 231 and a method for their formation into a prilled form is described in European Published Patent Application EP-A-62 523. Suitable examples of such compounds to be used herein are tetracetyl ethylene diamine (TAED), sodium 3,5,5 trimethyl

hexanoyloxybenzene sulphonate, diperoxy dodecanoic acid as described for instance in US 4 818 425 and nonylamide of peroxyadipic acid as described for instance in US 4 259 201 and n-nonanoyloxybenzenesulphonate (NOBS). Also suitable are N-acyl caprolactam selected from the group consisting of substituted or unsubstituted benzoyl caprolactam, octanoyl caprolactam, nonanoyl caprolactam, hexanoyl caprolactam, decanoyl caprolactam, undecenoyl caprolactam, formyl caprolactam, acetyl caprolactam, propanoyl caprolactam, butanoyl caprolactam pentanoyl caprolactam or mixtures thereof. A particular family of bleach activators of interest was disclosed in EP 624 154, and particularly preferred in that family is acetyl triethyl citrate (ATC). Acetyl triethyl citrate has the advantage that it is environmentally friendly as it eventually degrades into citric acid and alcohol. Furthermore, acetyl triethyl citrate has a good hydrolytical stability in the composition upon storage and it is an efficient bleach activator.

The compositions according to the present invention may comprise up to 30% by weight of the total composition of said bleach activator, or mixtures thereof, preferably from 1% to 20%, and more preferably from 2% to 10%.

Builders:

The compositions according to the present invention may further comprise a builder system. Any conventional builder system known in the art is suitable for use herein. Suitable builders for use herein include derivatives of succinic acid of the formula R-CH(COOH)CH_2(COOH) wherein R is C_{10-20} alkyl or alkenyl, preferably C_{12-16}, or wherein R can be substituted with hydroxyl, sulpho sulphoxyl or sulphone substituents. Specific examples include lauryl succinate, myristyl succinate, palmityl succinate, 2-dodecenylsuccinate, 2-tetradecenyl succinate. Succinate builders are preferably used in the form of their water-soluble salts, including sodium, potassium, ammonium and alkanolammonium salts.

Other suitable builders are oxodisuccinates and mixtures of tartrate monosuccinic and tartrate disuccinic acid such as described in US 4,663,071.

Further suitable builders for use herein are fatty acid builders including saturated or unsaturated C_{10-18} fatty acids, as well as the corresponding soaps.

Preferred saturated species have from 12 to 16 carbon atoms in the alkyl chain. The preferred unsaturated fatty acid is oleic acid.

The compositions herein may comprise from 0% to 10%, preferably from 1% to 7% by weight of the total composition of a builder system.

Method of cleaning a carpet

The present invention also encompasses a method of cleaning a carpet wherein a composition as described herein, is applied to said carpet, wherein said carpet is then optionally rubbed and/or brushed, and wherein said composition is then removed from said carpet.

Indeed, in the method of cleaning a carpet according to the present invention the step of applying a composition for the cleaning of carpets as described herein before, may be followed by a rubbing step and/or a brushing step. An advantage of the present invention is that the cleaning action of the present compositions starts as soon as said compositions are applied onto said carpet. Thus, the cleaning process of the present invention does not necessarily require rubbing and/or brushing. It is only in the case of highly soiled carpets or in the so called "high traffic areas" that the carpet may be cleaned by applying onto it a composition for the cleaning of carpets according to the present invention, then rubbing and/or brushing it more or less intensively for example by means of a sponge or a brush or other mechanical/electrical device, optionally with the aid of water. In general the rubbing/brushing-times are between 0.1 to a few minutes per square meters. After the composition for the cleaning of carpets according to the present invention has been applied onto the carpet and optionally rubbed and/or brushed, that said composition is removed from said carpet, preferably by mechanical means including brushing out and/or vacuum cleaning.

The compositions according to the present invention may be applied to the carpet to be cleaned either in neat or diluted form, this applies to compositions being either liquid compositions or granular compositions or powder compositions.

By "diluted form", it is meant herein that the compositions for the cleaning of carpets as described herein before may be diluted by the user, preferably with water. Compositions herein can be diluted up to 150 times, preferably up to 50 times and more preferably up to 25 times.

In a preferred embodiment herein, the compositions for the cleaning of carpets according to the present invention are liquid aqueous compositions. Indeed, a liquid aqueous composition, i.e., an aqueous as described herein before in its neat form or which has been diluted with water by the user or an aqueous composition resulting from the dilution of a granular composition or of a powder composition, is applied to the carpet to be cleaned, said carpet is optionally rubbed and/or brushed, then said composition is left to dry and then removed from said carpet. Indeed, said liquid aqueous composition is left to dry until said composition which combined with dirt has been changed into dry residues. These residues are then removed from the carpet mechanically. Such liquid aqueous compositions may be applied directly onto the area to be treated or applied using a cloth or piece of material such as spraying device or aerosol can, a sponge, a brush or other mechanical/electrical device. In a preferred embodiment of the invention a liquid aqueous composition is applied to the area to be treated by using a spraying device or an aerosol can. Such a spraying device may be trigger operated or pump operated or electrically operated or operated by any source of pressurised gas such as a can or a pressurizer. Such spraying devices are particularly preferable if a large area is to be treated as it facilitates the ease of use for the consumer. The spraying devices ensure uniform coverage of the area to be treated and maximises the advantage of the using liquid aqueous compositions containing peroxides. This is because the application of product by spray best allows the product to be left to dry on the area treated, even without rubbing or brushing. This optimises the action time of the composition and allows the best exploitation of the bleaching action of peroxides.

In another embodiment, the compositions for the cleaning of carpets according to the present invention are granular compositions or powder compositions. Such compositions for the cleaning of carpets according to the present invention may be applied directly onto the area of the carpet to be treated by for example sprinkling said composition over said area or may be applied by using a sponge,

a brush, or other mechanical/electrical device preferably in presence of water and then left to dry and then removed from said carpet.

The area to be treated using the compositions according to the present invention may be any size. In addition a complete section or even a whole carpet may be applied with the composition for the cleaning of carpets according to the present invention. For such purposes when using a liquid aqueous composition a spraying device with a pump to allow prolonged spraying is particularly useful.

The amount of the compositions for the cleaning of carpets according to the present invention applied will depend on the severity of the stain or soil. In the case of stubborn stains more than one application may be required to ensure complete removal of the stain. Indeed, the carpet cleaning compositions herein are particularly suitable to remove the dinginess of the carpets resulting from a diffused layer of soil which results from general wear.

The compositions according to the present invention may be used both for manual carpet cleaning and carpet cleaning machines. For carpet cleaning machines the compositions according to the present invention, i.e., either liquid compositions or granular compositions or powder compositions, may be preferably diluted according to the machine operating instructions. Furthermore, compositions to be used in such machines are formulated to prevent high sudsing.

According to the present invention the compositions herein may be used for the removal of stains and soils from carpets or upholstery as well as of odors. In addition the compositions according to the present invention may be used to hygienise or disinfect carpets and exterminate microinsects from the carpet or upholstery.

Method of cleaning fabrics:

The compositions herein may also be suitable to clean fabrics while been particularly safe to colours. Thus, the present invention also encompasses methods of cleaning fabrics including clothes, curtains, drapes, bed linens, bath linens, table cloths, sleeping bags, tents, upholstered furniture and the like.

In such a method, a composition, as defined herein, is contacted with the fabrics to be cleaned. This can be done either in a so-called "pretreatment mode", where a composition, as defined herein, is applied neat onto said fabrics before the fabrics are rinsed, or washed then rinsed, or in a "soaking mode" where a composition, as defined herein, is first diluted in an aqueous bath and the fabrics are immersed and soaked in the bath, before they are rinsed, or in a "through the wash mode", where a composition, as defined herein, is added on top of a wash liquor formed by dissolution or dispersion of a typical laundry detergent. It is also essential in both cases, that the fabrics be rinsed after they have been contacted with said composition, before said composition has completely dried off.

Indeed, it has been found that water evaporation contributes to increase the concentration of free radicals onto the surface of the fabrics and, consequently, the rate of chain reaction. It is also speculated that an auto-oxidation reaction occurs upon evaporation of water when the liquid compositions are left to dry onto the fabrics. Said reaction of auto-oxidation generates peroxy-radicals which may contribute to color damage. Thus, not leaving the liquid compositions, as described herein, to dry onto the fabric, in a process of pretreating soiled fabrics, contributes to reduce color damage when pretreating fabrics with liquid peroxygen bleach-containing compositions.

In the pretreatment mode, the method of cleaning fabrics comprises the steps of applying the liquid composition herein in its neat form onto said fabrics, or at least soiled portions thereof, and subsequently rinsing, or washing then rinsing said fabrics. In this mode, the neat compositions can optionally be left to act onto said fabrics for a period of time ranging from 1 min. to 1 hour, before the fabrics are rinsed, or washed then rinsed, provided that the composition is not left to dry onto said fabrics. For particularly though stains, it may be appropriate to further rub or brush said fabrics by means of a sponge or a brush, or by rubbing two pieces of fabrics against each other.

In another mode, generally referred to as "soaking", the method of cleaning fabrics comprises the steps of diluting the liquid composition herein in its neat form in an aqueous bath so as to form a diluted composition. The dilution level of the liquid composition in an aqueous bath is typically up to 1:85, preferably up

to 1:50 and more preferably about 1:25 (composition:water). The fabrics are then contacted with the aqueous bath comprising the liquid composition, and the fabrics are finally rinsed, or washed then rinsed. Preferably in that embodiment, the fabrics are immersed in the aqueous bath comprising the liquid composition, and also preferably, the fabrics are left to soak therein for a period of time ranging from 1 minute to 48 hours, preferably from 1 hour to 24 hours.

In yet another mode which can be considered as a sub-embodiment of "soaking", generally referred to as "bleaching through the wash", the liquid composition is used as a so-called laundry additive. And in that embodiment the aqueous bath is formed by dissolving or dispersing a conventional laundry detergent in water. The liquid composition herein in its neat form is contacted with the aqueous bath, and the fabrics are then contacted with the aqueous bath containing the liquid composition. Finally, the fabrics are rinsed.

Examples

The following examples will illustrate the present invention. The compositions are made by combining the listed ingredients in the listed proportions (weight % unless otherwise specified).

Compositions (weight %)	I	II	III	IV	V
Hydrogen peroxide	5.0	6.0	6.0	3.0	4.0
Na CnAS	3.0	--	1.0	3.0	3.0
PA	1.0	0.5	0.2	1.5	--
AMCP	--	1.0	2.0	--	2.0
C8 amine oxide	--	1.0	2.0	--	2.0
C14 amine oxide	--	1.0	1.0	--	--
C10 amine oxide	--	1.0	--	--	--
Salicylic Acid	0.3	0.04	0.2	0.06	0.1
HEDP	--	--	0.1	--	0.05

DETPMP	0.1	0.01	--	0.03	--
Benzyl alcohol	--	1.0	3.0	--	--
Isopropylalcohol	1.0	1.0	1.0	1.0	1.0
Ethoxyl ethanol	2.0	--	--	--	--
Butoxy ethanol	--	1.0	--	2.0	2.0
Propyl Gallate	0.01	0.03	0.1	0.02	0.01
Water	Balance	Balance	Balance	Balance	Balance
up to pH	5	4	5	6	5

Compositions (weight %)	VI	VII	VIII	IX	X	XI
Hydrogen peroxide	7.0	4.0	7.0	4.0	7.0	1.0
Na CnAS	1.0	2.5	3.0	3.0	2.0	3.0
PA	0.8	1.0	1.0	--	--	0.9
Salicylic acid	1.0	0.5	1.0	0.5	--	--
Glycine	--	--	--	--	1.0	0.03
DTPA	--	--	0.3	0.1	--	0.01
DETPMP	0.2	0.2	--	--	0.3	--
Water	Balance	Balance	Balance	Balance	Balance	Balance
up to pH	4	6	6	7	6	8

Compositions (weight %)	XII	XIII	XIV	XV	XVI	XVII

Hydrogen peroxide	7.0	6.0	4.0	6.0	6.0	6.0
Na CnAS	1.0	2.5	3.0	--	--	--
Lauryl betaine	--	--	--	2.4	2.4	2.4
Dobanol 45-7®	--	--	--	2.4	2.4	2.4
Dobanol 23-3®	--	--	--	1.2	1.2	1.2
PA	0.8	1.0	1.0	--	--	--
Salicylic acid	1.0	--	1.0	0.5	--	0.5
Citric acid	0.5	0.3	0.2	--	0.2	--
DTPA	--	--	0.1	0.2	--	--
DETPMP	0.2	0.1	--	--	0.1	0.2
Propyl gallate	--	--	--	--	0.1	0.1
Water up to pH	Balance 4	Balance 6	Balance 6	Balance 5	Balance 5	Balance 5

HEDP is 1 hydroxy ethylidene 1,1 diphosphonic acid commercially available from Monsanto or Bozzetto

AMCP is acrylic/malic based copolymers (Sokalan CP5®).

ATMP is aminotri(methylene phosphonate.

DETPMP is diethylene triamine penta methylene phosphonate available under the trade name DEQUEST®.

DTPA is diethylene triamine pentaacetate.

Na CnAS is sodium alkyl sulphate.

PA is an ethoxylated tetraethylenepentamine, average molecular weight about 70,000.

Dobanol 45-7® is a C14-C15 EO7 nonionic surfactant commercially available from Shell.

Dobanol 23-3® is a C12-C13 EO3 nonionic surfactant commercially available from Shell.

The compositions I to XIV in the examples above are suitable for the cleaning of carpets according to the present invention, i.e., they exhibit excellent overall

stain removal on particulate soil, greasy/oily soil, enzymatic and/or bleachable stains like coffee, tea and the like while being safe to colours. The compositions I to XIV above are particularly suitable to be used in manual carpet cleaning applications, neat or diluted, as well as in carpet cleaning machines.

The compositions XV to XVII above are particularly suitable for laundry application especially laundry pretreatment.

Excellent color safety is provided to the fabrics and carpets treated with the compositions above.

Claims

1. A composition comprising a peroxygen bleach, a chelating agent having a mobility factor greater or equal to 0.7 and a chelating agent having a mobility lower than 0.6, characterised in that the weight ratio of the chelating agent having a mobility factor greater or equal to 0.7 to the chelating agent having a mobility factor lower than 0.6 is of more than 1:1, with the exception of a liquid aqueous composition comprising hydrogen peroxide at a level of 7% by weight of the total composition, citric acid at a level of 0.3% by weight and diethylene triamine penta methylene phosphonate at a level of 0.2%.

2. A composition according to claim 1 wherein said chelating agent having a mobility factor greater or equal to 0.7 is selected from the group consisting of citric acid, glycine, salicylic acid, aspartic acid, glutamic acid, malonic acid, oxalic acid, succinic acid, picolinic acid, phthalic acid, dipicolinic acid, ethydronic acid, the corresponding conjugate base, and mixtures thereof.

3. A composition according to any of the preceding claims wherein said chelating agent having a mobility factor lower than 0.6 is an amino phosphonate chelating agent, a polyfunctionally-substituted aromatic chelating agent, an amino carboxylate chelating agent, other chelating agents like ethylene diamine N,N'- disuccinic acid and mixtures thereof, preferably aminotri(methylene phosphonate), amino alkylene poly (alkylene phosphonate), ethane 1-hydroxy diphosphonate. hydroxy ethylidene 1,1 diphosphonate, nitrilo trimethylene phosphonate, ethylene diamine tetra methylene phosphonate, diethylene triamine penta methylene phosphonate, dihydroxydisulfobenzene, ethylene diamine N,N'- disuccinic acid, ethylene diamine tetra acetate, diethylene triamine pentaacetate, diethylene triamine pentaacetate, N-hydroxyethylethylenediamine triacetate, nitrilotri-acetate, ethylenediamine tetrapropionate, triethylenetetraaminehexa-acetate, ethanoldiglycine, propylene diamine tetracetic acid, methyl glycine di-acetic acid or mixtures thereof, and preferably is diethylene triamine penta methylene phosphonate.

4. A composition according to any of the preceding claims wherein said chelating agent having a mobility factor greater or equal to 0.7 and said chelating agent having a mobility factor lower than 0.6 are present at a weight ratio of said chelating agent having a mobility factor greater or equal to 0.7 to said chelating agent having a mobility factor lower than 0.6 of 1.1:1 to 10:1, preferably of 1.2:1 to 6:1, more preferably of 1.5:1 to 4:1 and most preferably of 2:1 to 3.5:1.

5. A composition according to any of the preceding claims wherein said peroxygen bleach is selected from the group consisting of percarbonate, persilicate, persulphate, perborate, preformed peroxyacid, alkyl hydroperoxide, organic and inorganic peroxide, and mixtures thereof, and preferably is hydrogen peroxide.

6. A composition according to any of the preceding claims which comprises from 0.01% to 20% by weight of the total composition of peroxygen bleach or mixtures thereof, preferably from 0.5% to 10% and more preferably from 1% to 7%.

7. A composition according to any of the preceding claims which comprises up to 50% by weight of the total composition of a surfactant selected from the group consisting of anionic surfactant, amphoteric sufactant, nonionic surfactant, zwitterionic surfactant, cationic surfactant and mixtures thereof, preferably from 0.1% to 30% and more preferably from 0.5% to 10%.

8. A composition according to claim 7 wherein said surfactant is an anionic surfactant, preferably a sarcosinate surfactant and/or an alkyl sulphate surfactant, and/or an amine oxide surfactant according to the formula $R_1R_2R_3NO$ wherein R1 is a saturated linear or branched alkyl group of from 1 to 30 carbon atoms, preferably of from 6 to 20 carbon atoms, more preferably of from 6 to 16 carbon atoms, and wherein R2 and R3 are independently substituted or unsubstituted, linear or branched alkyl groups of from 1 to 4 carbon atoms, preferably of from 1 to 3 carbon atoms, and more preferably are methyl groups, or mixtures thereof.

9. A composition according to any of the preceding claims which further comprises a radical scavenger up to a level of 1% by weight of the total composition, preferably from 0.01% to 0.1%, and more preferably from 0.01% to 0.06% and wherein said radical scavenger preferably is propyl gallate.

10. A composition according to any of the preceding claims which further comprises a solvent typically selected from the group consisting of buthoxypropanol, propoxy ethyl acetate, ethanol-2-butoxy phosphate, 2-(hexyloxy)ethanol, 2-ethoxy ethanol, 2-butoxyethanol, n-butoxypropoxypropanol, butyl triglycol ether, butyl diglycol ether, 2-(2-alkoxyethoxy)ethanol, 2-(2-alkoxyethoxy)propanol, 2-(2-alkoxyethoxy)butanol, 2-ethyl-1,3-hexanediol, 2,2,4-trimethyl-1,3-pentanediol, methyl-2,4 pentanediol, benzyl alcohol, ethanol, methanol, propanol, isopropanol and a mixture thereof, and preferably is isopropanol and/or benzyl alcohol.

11. A composition according to any of the preceding claims which further comprises at least one ingredient selected from the group consisting of soil suspending polyamine polymer, soil suspending polycarboxylate polymer, hydroxy-pyridine N-oxides and derivatives thereof, builder systems, other solvents, perfumes, dyes, suds suppressing agents, enzymes, photobleaching agents, and mixtures thereof.

12. A composition according to any of the preceding claims which is a liquid composition, preferably an aqueous liquid composition.

13. A composition according to claim 12 wherein said composition is packaged in a spray dispenser.

14. A composition according to any of the claims 1 to 11 wherein said composition is a powder composition or a granular composition.

15. A method of cleaning a carpet wherein a composition according to claim 14, is applied to said carpet, wherein said carpet is then optionally rubbed

and/or brushed, and wherein said composition is then removed from said carpet.

16. A method of cleaning a carpet wherein a composition according to claim 12 is applied neat or diluted to said carpet, or wherein a composition according to claim 14 is diluted typically with water before being applied to said carpet, said carpet is then optionally rubbed and/or brushed, and said composition is left to dry before being removed from said carpet.

17. A method according to claim 16 wherein said composition is used in carpet cleaning machines.

18. A method according claim 16 wherein said composition is applied to said carpet by means of a spraying device or an aerosol can.

19. A method according to claims 15, 16, 17 or 18 wherein said composition is removed from said carpet by mechanical means including brushing out and/or vacuum cleaning.

20. A method of pretreating fabrics which comprises the steps of applying a liquid composition according to claim 12, in its neat form, onto said fabrics, preferably only soiled portions thereof, before rinsing said fabrics, or washing then rinsing said fabrics.